

OBSERVATIONS ON *PSEUDOMONOTIS*, A LATE
PALEOZOIC PELECYPOD

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While the writer was collecting data on the validity of reports of Paleozoic Ostreidae, he found that the question of the time of origin of shell attachment in pleurothetic pelecypods was important. Especially for this latter problem, it was necessary to study the genus *Pseudomonotis*,¹ a member of the Paleozoic Pectinacea.

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The earliest pelecypods are equivalve free living types. Byssal attachment also is found in many ancient pelecypods, but some of the other adaptations to various kinds of environment appear much later. One of the latter is the oyster-like habit of having one valve cemented to the substrate. This adaptation has originated independently many times in various pelecypod stocks and is common from the Mesozoic to the Recent. Occurrences in the Paleozoic are apparently meager.

There is infrequent mention in the description of Paleozoic pelecypods about the occurrence of shell fixation by cementation. Jackson (1890, pp. 325, 326) points out that the earliest oyster is one described by Barrande (1881, pp. 233, 234) as *Pracostrea bohémica* from the Upper Silurian. In the description of this species Barrande does not refer to attachment of either valve or to an attachment scar, although fig. 4 of plate 111 may show either that there is an attachment scar or that the umbo of the specimen is broken. This is apparently the only reference to a Pre-Carboniferous oyster. In a few scattered monographs, most of which were written before 1900, a few poorly preserved specimens have been described as members of the family Ostreidae.

According to Newell (personal communication) these specimens of so-called *Ostrea* from the Pennsylvanian and Permian

¹ *Pseudomonotis* is here used in the same generic sense as Newell (1938, p. 92) applied it, genotype *Gryphites spluncarius* Schlotheim, by subsequent designation.

can probably all be allocated to the genus *Pseudomonotis*. A careful check of descriptions and figures has led the writer to the same conclusion. *Pseudomonotis*, unlike the oyster, was attached by the right valve and not by the left one. Morphologically the genus comprises a large and heterogeneous group which, because of its attached habit, showed a reduction of the ears and assumed the form of an oyster. Some species are gryphaeoid in form while others have typically flat valves and show a pronounced attachment scar. *Pseudomonotis hawni*, as figured by Newell (1938, pl. 17, figs. 8, 11a), clearly shows the scar of fixation.

Newell (personal communication) believes that *Pseudomonotis* may have had a method of attachment like *Anomia* because in many forms the byssal notch seems to have been so overgrown at the periphery that it was in effect a perforation. The irregular growth of the adult specimens during later life and the fact that some Pennsylvanian species show the transfer of surface ornamentation of the host to which the shell was attached has convinced Newell that *Pseudomonotis* was fixed by its shell. On the other hand specimens of *Pseudomonotis speluncaria* in the paleontology collection at Stanford University show no signs of attachment. Large, flat, oyster-like specimens from the Gamma member of the Kaibab formation of Arizona clearly indicate that they were attached during the adult stage.

Pseudomonotis, which has a geologic time range from Pennsylvanian through Permian, is the only Paleozoic pelecypod definitely proved to have acquired shell fixation. From Triassic onward the occurrence of this adaptive habit appears widespread among this class of molluses.

Why this adaptation was not more common and did not occur early in the Paleozoic is not known. Certainly the number of genera and species of Paleozoic pelecypods is great. Perhaps the best explanation for the scarcity of this modification is given by Dacqué (1921, p. 296) who states that the brachiopods were the dominant group of animals in the same type of environment in the Paleozoic that the pelecypods occupied from the Mesozoic to the Recent. Many brachiopods during the Paleozoic attached themselves to the hard substrate by shell fixation. With the rapid disappearance of numerous brachiopod genera at the end

of Permian time, and their continued decrease in numbers throughout the Mesozoic, the similarly adapted pelecypods could take over the environmental niches left by the brachiopods. Adaptive radiation in the pelecypods has been developed to its fullest extent from Mesozoic time onward.

As a resumé the following conclusions can be presented:

1. Members of the family Ostreidae do not appear in the Paleozoic Era, and species described in this family belong to the genus *Pseudomonotis*, a member of the superfamily Pectinacea.

2. Fixation to the hard substrate with the accompanying modifications of shell morphology have so far definitely been proved to occur only in *Pseudomonotis* which has a geologic time range from Pennsylvanian through Permian. Further investigation may find other examples of this adaptation and even earlier cases of it than are recorded here. However, these additional cases will not alter the fact that shell fixation by cementation in pelecypods occurs rarely in the Paleozoic Era.

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